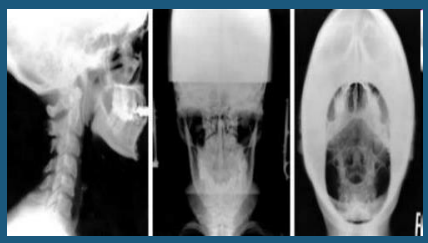
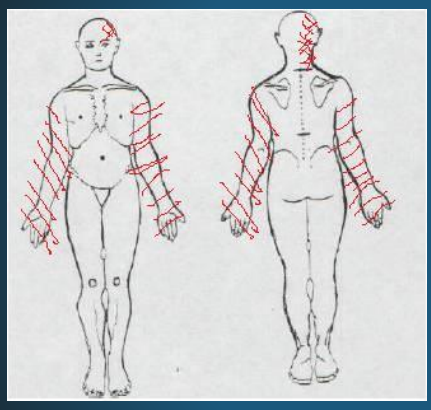
Upper Cervical Differential Case



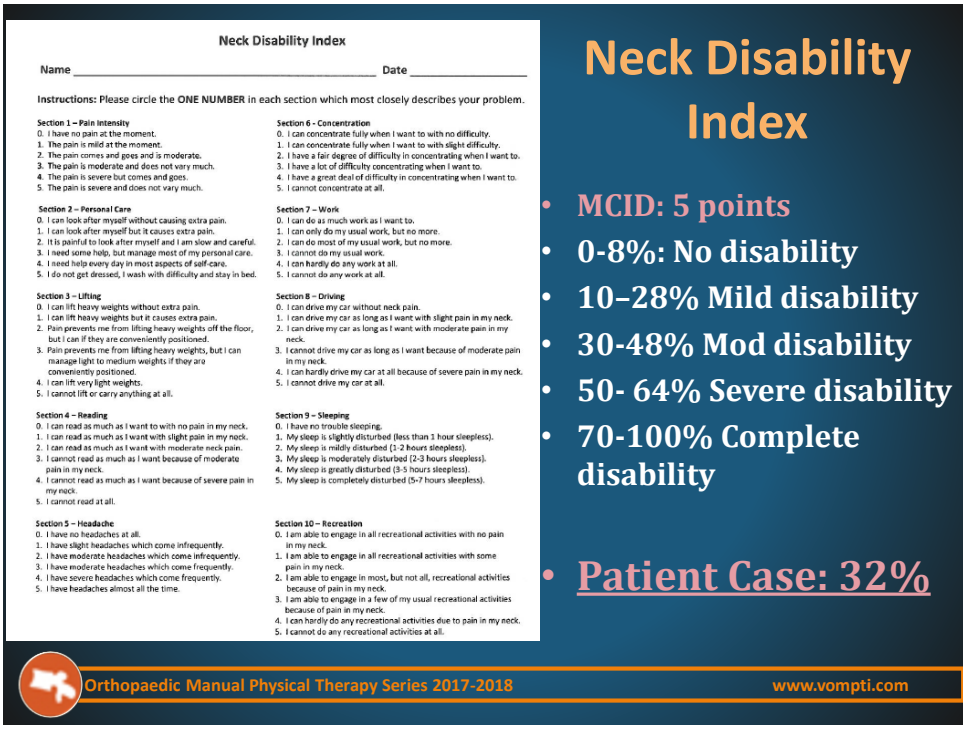
Orthopaedic Manual Physical Therapy Series
Charlottesville 2017-2018

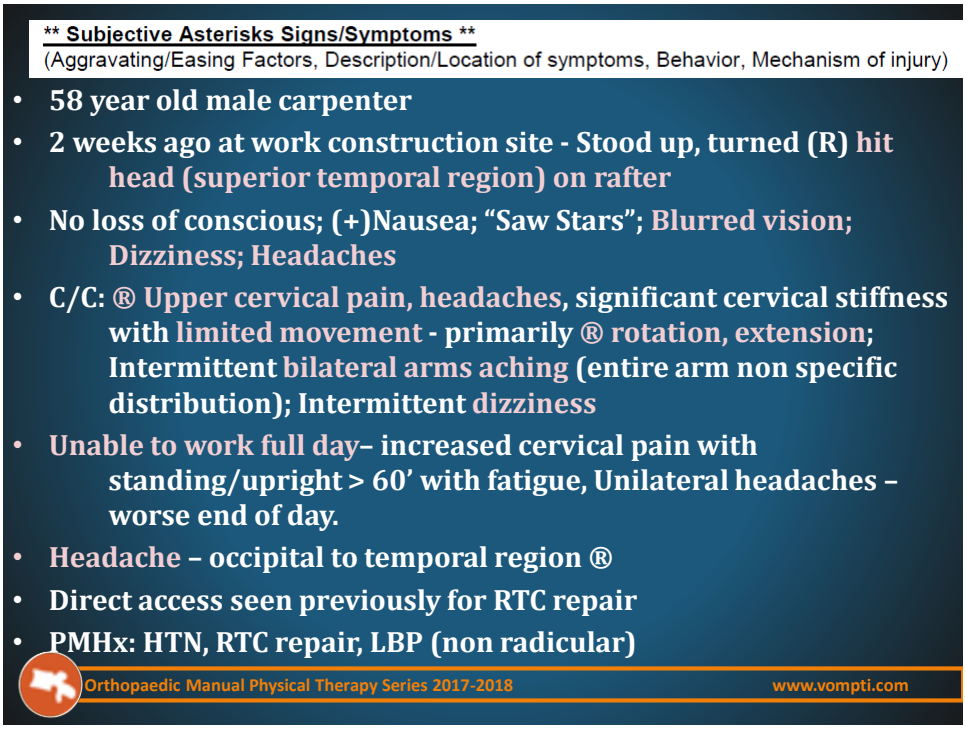
Eric M Magrum DPT OCS FAAOMPT

Body Diagram_Initial Hypothesis



- Cervical Myelopathy
- Central Disc Displacement
- Cervicogenic Headache
- Cervical Arterial Dysfunction
- Cervical Myofascial Strain





Direct Access Decision Making

- Treat
- Treat/Re asses and potentially refer
- Refer out

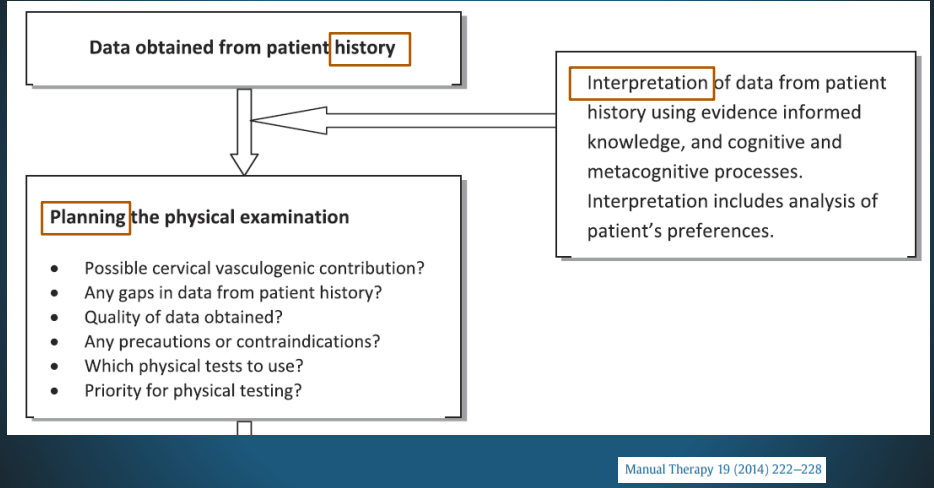
Planning the Objective Exam

Develop a working Hypothesis

- Use of SINS as framework
- Determine examination extent and vigor
- Structures to be examined
- Red Flag Screen/Clearing
- Neurological Exam

Special Questions

- Hx of trauma (C Spine Rules, CAD Clearance, CNS Tests, CV Ligt. Stress Tests)
- Hx of Rheumatic disease or URTI (CV Ligt. Stress Tests)
- Dizziness / Nausea / Vomiting (CAD Clearance, Vestibular)
- Severe ongoing HA (CAD Clearance)
- (B) or quadrilateral paresthesia (CAD Clearance, CNS Tests)
- Lip / Perioral paresthesia (CAD Clearance, CNS Tests)
- Ataxia (CAD Clearance, CNS Tests)
- Visual problems i.e. Diplopia (CAD Clearance)
- Drop attacks (LOB w/o LOC) (CAD Clearance, CNS Tests)
- Cough producing radicular pain (acute disc, possible Neoplasm)
- Unexplained weight loss/gain
- Sx related to EXERTION or EMOTIONAL STRESS (Cardiac)
- Steroid orally, &/or repeated injections
- Anticoagulants



Manual Therapy 19 (2014) 222–228

Primary HYPOTHESIS after Subjective Examination: _____

Differential List: (List in ranking order to screen/clear - Rule out)

- **Primary Hypothesis:** Cervicogenic Headache

Differential Diagnosis

- Cervical Fracture (Upper Cervical)
- CAD- Vascular Injury/insult
- Cervical Myleopathy
- Cervical Central Discogenic
- Cervical Instability – Ligament injury
- Vestibular origin of dizziness
- Cervicogenic Dizziness
- Upper Cervical Joint Dysfunction
- Cervical myofascial dysfunction/injury – strain

Cranio Vertebral Region

- Critical area
- May be the site of serious pathology
- Acute cervical patient may have a life threatening injury requiring immediate referral
- Assess the sub cranial region to rule out more serious pathology.
- Cranio Vertebral Screen/Clear
  - Clinical decision tools
  - Possible treatment of the cranio vertebral region
  - Referral out for additional medical evaluation

Cardinal Signs and Symptoms.

- Symptoms serious enough to suggest CNS involvement.
- Many causes of these symptoms are benign, however it is safer to assume that the cause is serious and refer the patient back to the physician for further testing:
  - An overt loss of balance in relation to head/neck positions, without loss of consciousness- 'Drop attacks'
  - Facial/Lip paresthesia reproduced by active or passive movements
  - Lateral nystagmus with active or passive head/neck movements
  - Bilateral or Quadrilateral limb paresthesia or ataxia; either constantly or reproduced by head/neck movements.

Look and Listen for:

- Five "Ds"
  - Dizziness
  - Drop attacks
  - Diplopia
  - Dysarthria
  - Dysphagia
- And
  - Ataxia
- Three "Ns"
  - Nausea
  - Numbness
  - Nystagmus

Non Cardinal Signs/Symptoms

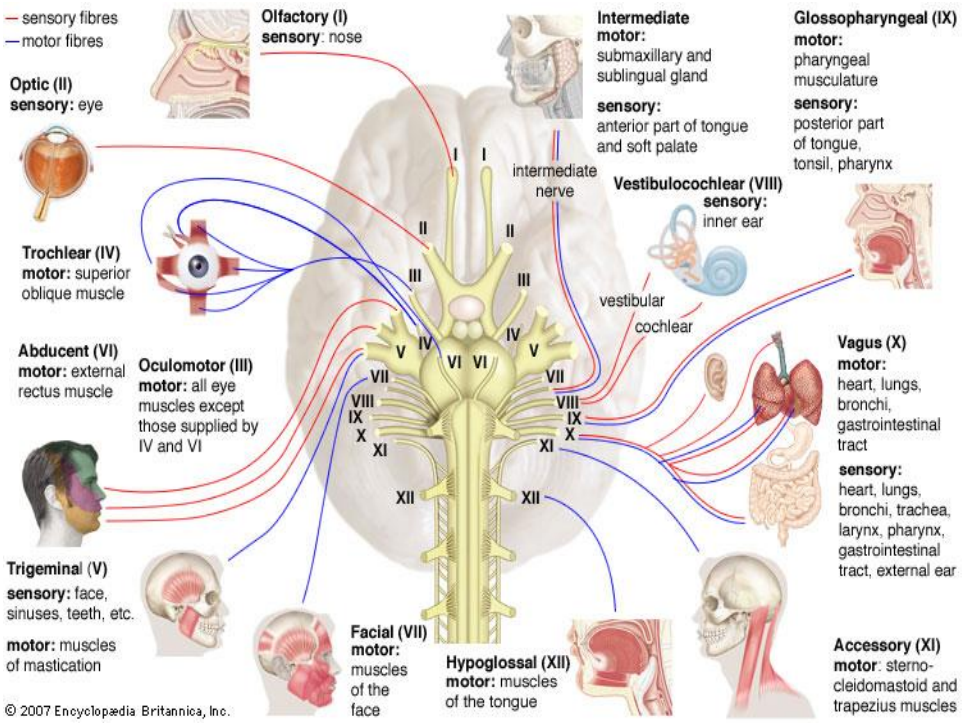
- Dizziness
- Blurred vision
- Drowsiness
- Vertigo
- Tinnitus
- Coldness
- Nausea
- Fainting
- Clumsiness
- Vomiting
- Lump in throat
- Heaviness
- Severe HA
- Hoarseness
- Hypo- / Hyperacusia

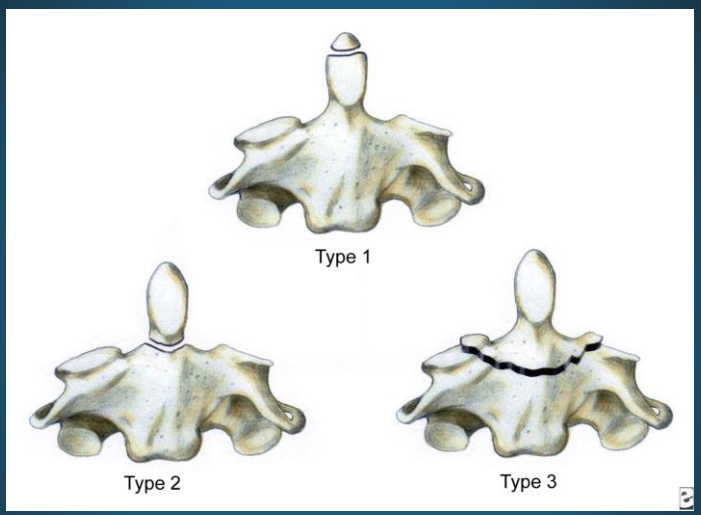
Indications for Cranial Nerve Testing

- Suspicious questioning or complaints
  - "Cranial Nerve special questions"
- Observable signs of VBI/CAD
- (+) VBI testing or dizziness provoked by exam
- S/S of UMN pathology
- Whiplash or trauma to head and/or neck
- Headache – esp recent onset or severity change
- (+) UC Stability Testing
- History of seizure
- Memory deficit and/or change
- History of syncope
- Known anomaly in the region (Arnold Chiari, Klippel-Feil Syndrome)

Cranial Nerve Exam

I. Olfactory	Soap smell recognition
II. Optic	Confrontation/peripheral focus
III. Occulomotor	Tracking/Convergence (med/lateral)
IV. Trochlear	" "
V. Trigeminal	Bilateral sensation at forehead
VI. Abducens	Tracking/Convergence (med/lateral)
VII. Facial	Smile/frown
VIII. Vestibulocochlear	Rub finger/thumb equidistant from pt's ears
IX. Glossopharangeal	Gag – not tested
X. Vagus	"AHH"–symmetrical elevation-soft palate/uvula
XI. Spinal Accessory	Atrophy SCM/Trapezius
XII. Hypoglossal	Tongue deviation with protrusion





The Canadian C-Spine Rule Performs Better Than Unstructured Physician Judgment

Conclusion: Interobserver agreement of unstructured clinical judgment for predicting clinically important cervical spine injury is only fair, and the sensitivity is unacceptably low. The Canadian C-Spine rule was better at detecting clinically important injuries with a sensitivity of 100%. Prospective validation has recently been completed and should permit widespread use of the Canadian C-Spine rule.

[*Ann Emerg Med.* 2003;42:395-402.]

Establishing a Clinical Prediction Rule

- **The establishment of a prediction model in clinical practice requires four distinct phases:**

- ***Development***—Identification of predictors from an observational study
- ***Validation***—Testing of the rule in a separate population to see if it remains reliable
- ***Impact analysis***—Measurement of the usefulness of the rule in the clinical setting in terms of cost-benefit, patient satisfaction, time/resource allocation, etc
- ***Implementation***—Widespread acceptance and adoption of the rule in clinical practice.

Figure 12. Canadian C-spine Rule (CCR)

Any high-rish factor that mandates radiography?
1. Age > 65 years
2. Dangerous mechanism
3. Paresthesias in extremities

Dangerous mechanisms:
- fall from ≥3 ft or 5 stairs
- an axial load to the head
- a motor vehicle accident
  - at high speed (>100 km/hr)
  - rollover
  - ejection
- a collision involving a motorized recreational vehicle
- a bicycle collision

NO

Any low-risk factor that allows safe range of motion assessment?
1. Simple rear-end MVA
2. Sitting position in the ED
3. Ambulatory at any time
4. Delayed neck pain onset
5. No midline cervical tenderness

YES

NO

Able to rotate neck actively (45˚ left and right)

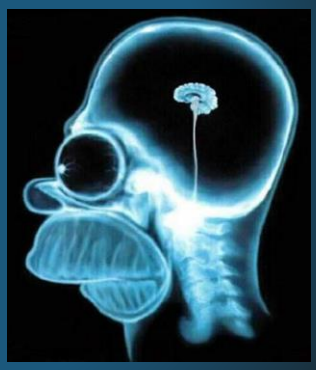
YES

NO

Radiography

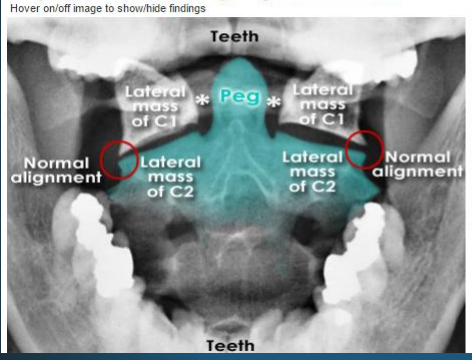
No Radiography

(-)



C-spine normal anatomy - Open mouth view

Hover on/off image to show/hide findings



C-spine normal anatomy - Open mouth view

- This view is considered adequate if it shows the alignment of the lateral processes of C1 and C2 **(red circles)**
- The distance between the peg and the lateral masses of C1 **(asterisks)** should be equal on each side
- **Note:** In this image the odontoid peg is fully visible which is not often achievable in the context of trauma due to difficulty in patient positioning

[RESIDENT'S CASE PROBLEM]

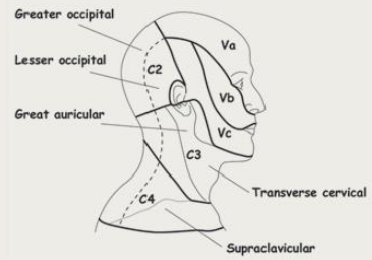
MICHAEL D. ROSS, PT, DHSc, OCS[1] • JOHN M. CHEEKS, PT, MHS, DPT, CSST[2]

JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY | VOLUME 38 | NUMBER 7 | JULY 2008

Clinical Decision Making Associated With an Undetected Odontoid Fracture in an Older Individual Referred to Physical Therapy for the Treatment of Neck Pain

TABLE 1 — **Red Flags From This Patient's History, Physical Examination, and Conventional Radiographs**

Patient history
- Fall resulting in an impact to the forehead
- Age greater than 65 years
- History of osteoporosis
- History of breast cancer
- History of a humeral head fracture from a prior fall
- Pain greater at night
- Immediate neck pain at the time of her fall
- Symptoms worsening since fall



Physical examination
- Limited active cervical range of motion, especially rotation
- Increased sharp upper cervical spine pain with movement
- Significant midline palpatory tenderness throughout the cervical and thoracic regions
- Decreased sensation in the C2 and C3 dermatomes
- Decreased bilateral upper extremity proximal muscle strength

Conventional radiographs
- Radiographic images underexposed
- Unable to visualize the odontoid well on the open mouth view
- Unable to visualize C7 on the lateral view

Neurological Exam

- **Upper Quarter Neuro Exam**
  - DTRs : Upper/Lower Quarter Hyper reflexia
  - Myotomal strength
  - Sensation testing
- **Upper Motor Neuron Tests:**
  - Babinski
  - Hoffman's: flick DIP of middle finger – positive test flexion of index and thumb ("OK sign is not OK"). (-)
  - Clonus – wrist/ankle

Cervical Myelopathy

Cervical Myelopathy

- **Causes:**
  - Spinal cord compression in the spinal canal due to osteophyte, and/or disc degeneration
- **Symptoms:**
  - Hyper reflexia UE and LE
  - Sensory changes in non segmental pattern, common in 1 or both hands/feet
  - (+) Clonus
  - (+) Hoffman's Reflex
  - (+) Babinski
  - (+) Inverted Supinator Reflex/Sign
  - General weakness below level of compression
  - Gait changes, tripping/falling for no reason

A Pragmatic Neurological Screen for Patients With Suspected Cord Compressive Myelopathy

Chad E Cook, Eric Hegedus, Ricardo Pietrobon, Adam Goode

- **Poor Sensitivity**
  - Finger escape
  - Grip-Release
  - Clonus
  - Inverted Supinator
    - Finger flexion/slight Triceps EXT with Brachioradialis DTR
  - Babinski
  - Hoffman's

Conclusions

- Comprehensive Subjective History
- Special questions
- Referral out for MRI
- Utilize Cluster of Tests

PTJ 2007

Clustered clinical findings for diagnosis of cervical spine myelopathy

Conclusion

This study found that selected combinations of clinical findings that consisted of (1) gait deviation; (2) +Hoffmann's test; (3) inverted supinator sign; (4) +Babinski test; and (5) age >45 years were affective in ruling out and ruling in cervical spine myelopathy.

Table 3 Clustered findings for diagnosis of cervical spine myelopathy

Clustered results	Sensitivity (95% CI)	Specificity (95% CI)	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)
1 of 5 positive tests	0.94 (0.89–0.97)	0.31 (0.27–0.32)	1.4 (1.2–1.4)	0.18 (0.12–0.42)
2 of 5 positive tests	0.39 (0.33–0.46)	0.88 (0.84–0.92)	3.3 (2.1–5.5)	0.63 (0.59–0.79)
3 of 5 positive tests	0.19 (0.15–0.20)	0.99 (0.97–0.99)	30.9 (5.5–181.8)	0.81 (0.79–0.87)
4 of 5 positive tests	0.09 (0.06–0.09)	1.0 (0.98–1.0)	Inf (3.9–Inf)	0.91 (0.90–0.95)

Journal of Manual and Manipulative Therapy 2010

Cervicogenic Dizziness: A Review of Diagnosis and Treatment

Diane M. Wrisley, MS, PT, NCS[1]
Patrick J. Sparto, PhD, PT[2]
Susan L. Whitney, PhD, PT, ATC[3]
Joseph M. Furman, MD, PhD[2]

Abnormal afferent input from injured cervical myofascia and upper cervical joint mechanoceptors

Diagnosis of Exclusion – R/O Vestibular, CNS etiology

J Orthop Sports Phys Ther • Volume 30 • Number 12 • December 2000

TABLE 5. The appropriate action to be taken by a physical therapist based on various additional symptoms in patients presenting with dizziness or vertigo.

Unexplained or new onset of symptoms that may require immediate medical attention	Symptoms that require nonemergent referral to an otolaryngologist	Symptoms that can be treated by a physical therapist
• Constant vertigo	• Constant dizziness	• Transient dizziness
• Feeling of being pushed to one side	• Unilateral hearing loss	• Cervical pain
• Facial asymmetry	• New onset of tinnitus	• Limited cervical range of motion
• Swallowing dysfunction	• Aural fullness (stuffiness in ear)	• Radicular upper extremity symptoms
• Speech problems	• Ear pain	• Headache
• Oculomotor dysfunction (cranial nerves III, IV, VI)	• Transient vertigo	• Balance complaints
• Ptosis		• Jaw pain
• Vertical nystagmus		• Visual sensitivity
• Loss of consciousness		• Nausea/vomiting*
• Repeated, unexplained falls		• Anxiety, fatigue*
• Changes in sensation		
• Severe headache		
• Upper motor neuron signs and symptoms		

CNS → ER **ENT** **MSK→PT**

Orthopaedic Manual Physical Therapy Series 2017-2018 www.vompti.com

	BPPV	VBI
Position/movement	Specific head movement in relation to gravity, +ve Hallpike manoeuvre	Sustained neck posture
Nystagmus	Torsional, decreases	Vertical, continues
Fatiguability	Intensity decreases	Intensity increases
Signs/symptoms	Rotatory vertigo, disequilibrium	5 Ds, hemiparesis, visual disturbances

Manual Therapy 9 (2004) 95–108

Utility of a brief assessment tool developed from the Dizziness Handicap Inventory to screen for Cervicogenic Dizziness: a case control study

Patients with Cervicogenic Dizziness:

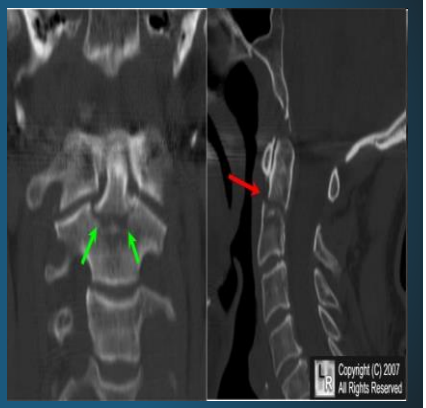
- Yes - Dizziness with "Looking Up"
- Yes - Dizziness with "quick movements of your head"
- No – " afraid to leave your home without having someone with you"

positive likelihood ratio of 2.28
negative likelihood ratio of 0.35

Musculoskeletal Science and Practice (2017)

Craniovertebral Ligament Dysfxn

- Trauma can cause compromise to this region
- Isolated ligament compromise is rare
- Fracture typically occurs (odontoid or arch of atlas) with ligament avulsion
- More common mechanism is disease.



Craniovertbral Ligament Dysfxn

- Rheumatoid Arthritis, Ankylosing Spondylitis, Reiter's Disease, URTIs, and Down's Syndrome can destabilize C1/C2 and lead to cord compression and/or vertebral artery compromise.
- All patients with history of the above disorders should be assessed for upper cervical instability; as must patients complaining of dizziness.
- Dysfunction in this area can be the cause of the dizziness

[RESIDENT'S CASE PROBLEM]

PAUL E. MINTKEN, PT, DPT[1,2] • LISA METRICK, PT, DPT[2] • TIMOTHY FLYNN, PT, PhD[3]

Upper Cervical Ligament Testing in a Patient With Os Odontoideum Presenting With Headaches

JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY | VOLUME 38 | NUMBER 8 | AUGUST 2008

- 23 yo female
- 10/10 daily HAs, Agg with Cervical EXT
- NDI 54% = Severe disability
- 2 yr hx intermittent LQ paresthesia
- Upper cervical flexion → (+) Bilat LQ sxs
- (+) Sharp-Purser → relieves sxs
- (+) Transverse ligt/Ant shear test → (+) bilat LQ sxs
- Referred back to MD for further imaging
- (+) Klippel-Feil (congenital fusion C2/3); Os odontoid

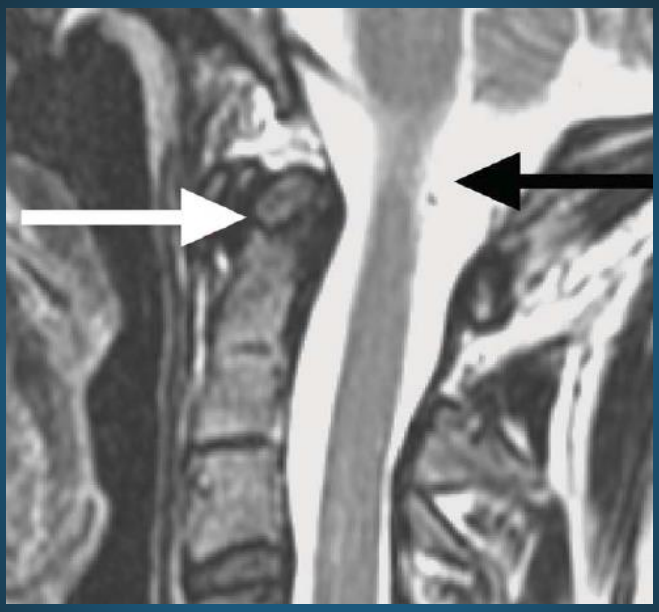
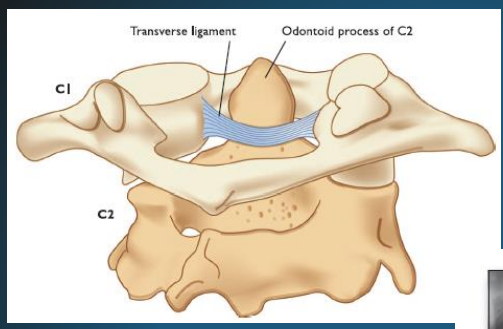
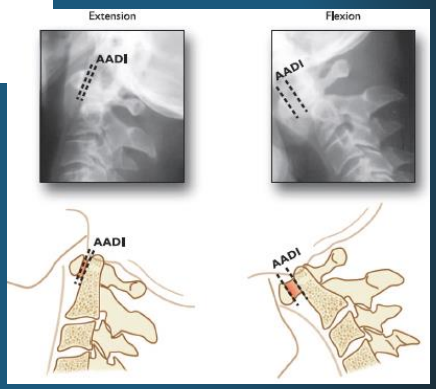


FIGURE 4. Sharp-Purser test. The palm of one hand is placed on the patient's forehead while the spinous process of the axis is held by a pinch grip of the opposite hand. Then the head and neck are the gently flexed. Through palmar pressure on the forehead, the occiput and atlas are translated posteriorly.





Transverse Ligament

Anatomy

Stretches from tubricles on anterior arch of the atlas to attach on the posterior aspect of the dens.

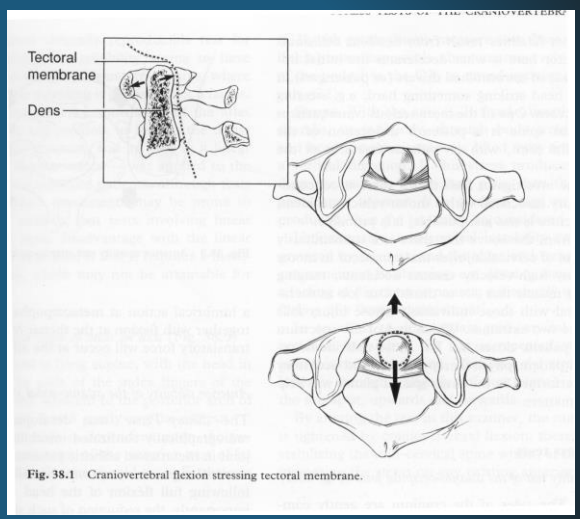


Fig. 38.1 Craniovertebral flexion stressing tectoral membrane.

Transverse Ligament

Function

Limit anterior displacement of the atlas during flexion, preventing spinal canal stenosis and compression.

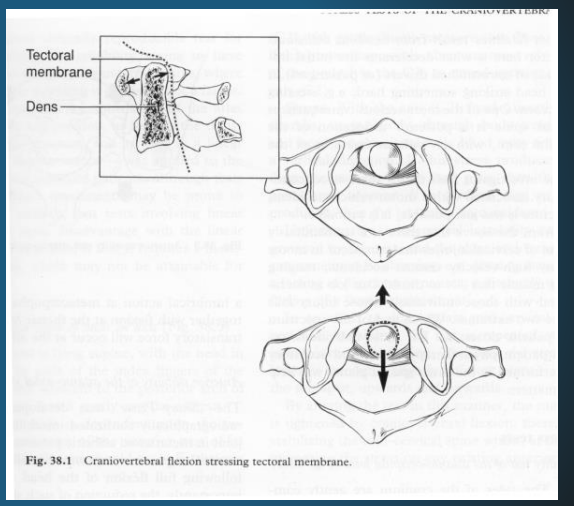


Fig. 38.1 Craniovertebral flexion stressing tectoral membrane.

Transverse Ligt Stress Test

- Pt lies supine in neutral.
- Support the occiput in the palms of the hands and the 3rd-5th digits, with the two index fingers placed between the occiput and C2 spinous process, overlying the neural arch of the atlas.
- The head and axis are sheared anteriorly together, the head is maintained in neutral and gravity fixes the neck.
- Lift Head – Intact Transverse Ligt brings C2 with

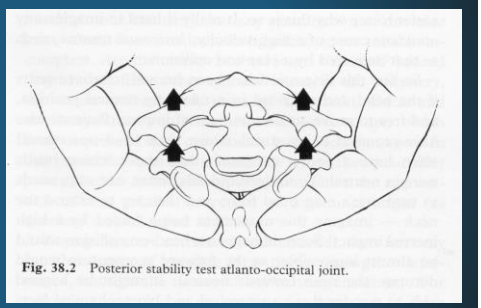
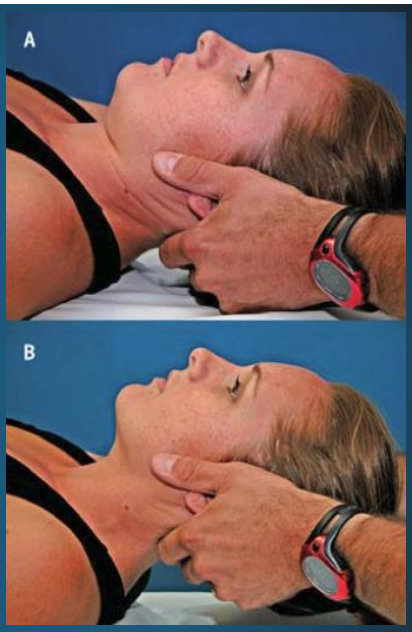


Fig. 38.2 Posterior stability test atlanto-occipital joint.

Transverse ligament or anterior shear test.



AUGUST 2008 | VOLUME 38 | NUMBER 8 | JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY

Transverse Ligt Stress Test

- **Positive test:**
  - Nystagmus
  - Spasm
  - Abnormally soft end feel
  - Dizziness
  - Nausea
  - Facial or limb paresthesia
  - Consistent reflex swallowing
  - Feeling of a limp in the throat

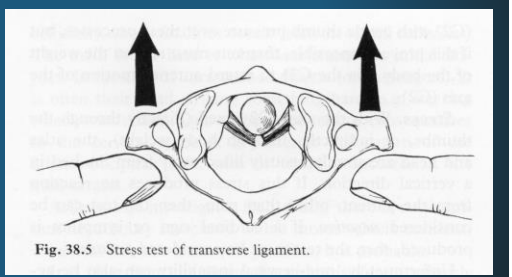


Fig. 38.5 Stress test of transverse ligament.

Upper Cervical Ligamentous Disruption in a Patient With Persistent Whiplash Associated Disorders

JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY | VOLUME 38 | NUMBER 6 | JUNE 2008

JAMES ELLIOTT, PT, PhD, *Postdoctoral Research Fellow, Centre of Clinical Research Excellence in Spinal Pain Injury and Health, The University of Queensland, Brisbane, Australia.*
JASON CHERRY, PT, MS, *Owner and Director, Belmar Physical Therapy, Lakewood, Colorado, USA.*

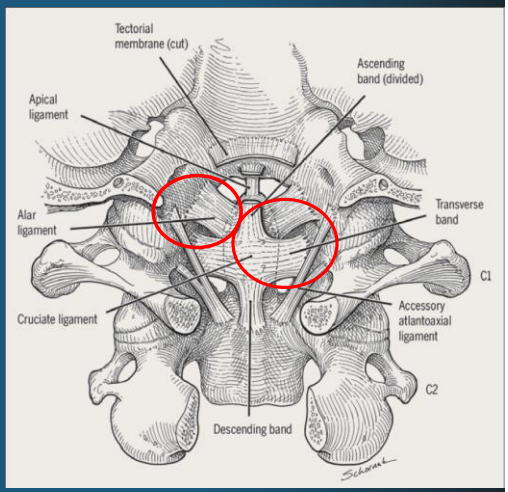
- **51 yo female**
- **HX: 2 MVAs 7 years ago**
- **C/o: Constant neck pain, dizziness, anxiety, fatigue**
- **"Clunking" with Cervical AROM**
- **(+) Alar Ligt testing**
- **MRI (+) Alar, Transverse Grade II**

FIGURE 1. Coronal proton-density magnetic resonance imaging indicating a grade II signal intensity change in the left alar ligament, suggestive of disruption (arrows).

FIGURE 2. Axial proton-density magnetic resonance imaging indicating a grade II signal intensity change in the left transverse ligament, suggestive of disruption (arrows).

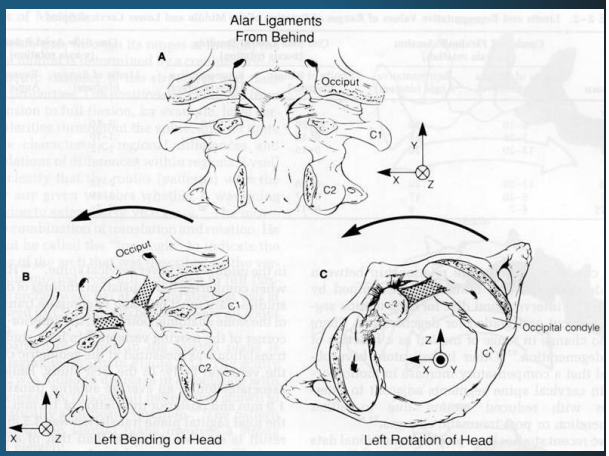
Alar Ligament

Runs from the posterior aspect of the upper 2/3 of the dens to the medial aspect of the occipital condyle.



Alar Ligament

- ***Function***
- Lateral flexion of the occiput on the atlas is accompanied by immediate ipsilateral rotation of the axis beneath the atlas.
- (L) Occipital SB tightens (R) Alar, causing (L) Rotation C2



Alar Ligament Test

- Pt supine or seated with the therapist palpating the spinous process of C2
- The head is lateral flexed on the neck
- Therapist should feel immediate contra lateral rotation of the spinous process as the axis rotated to the same side
- Lateral flexion head on neck (L), palpates C2 spinous process 'kick' ® as C2 rotates (L) secondary to the pull of an intact Alar complex

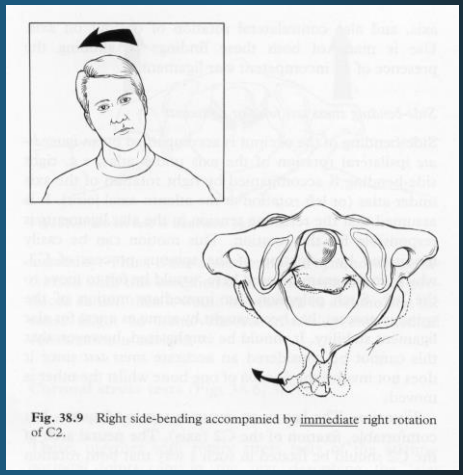


Fig. 38.9 Right side-bending accompanied by immediate right rotation of C2.

Alar Ligament Test

- **(+) Test:**
- No ipsilateral rotation
- Nystagmus
- Spasm
- Abnormally soft end feel
- Dizziness
- Nausea
- Facial or limb paresthesia
- Any Cardinal/CN signs/sxs

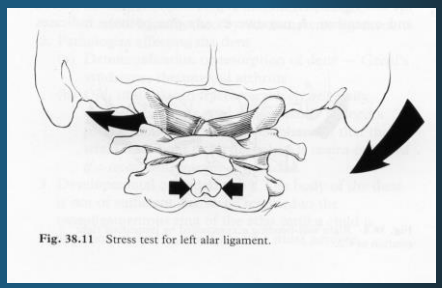
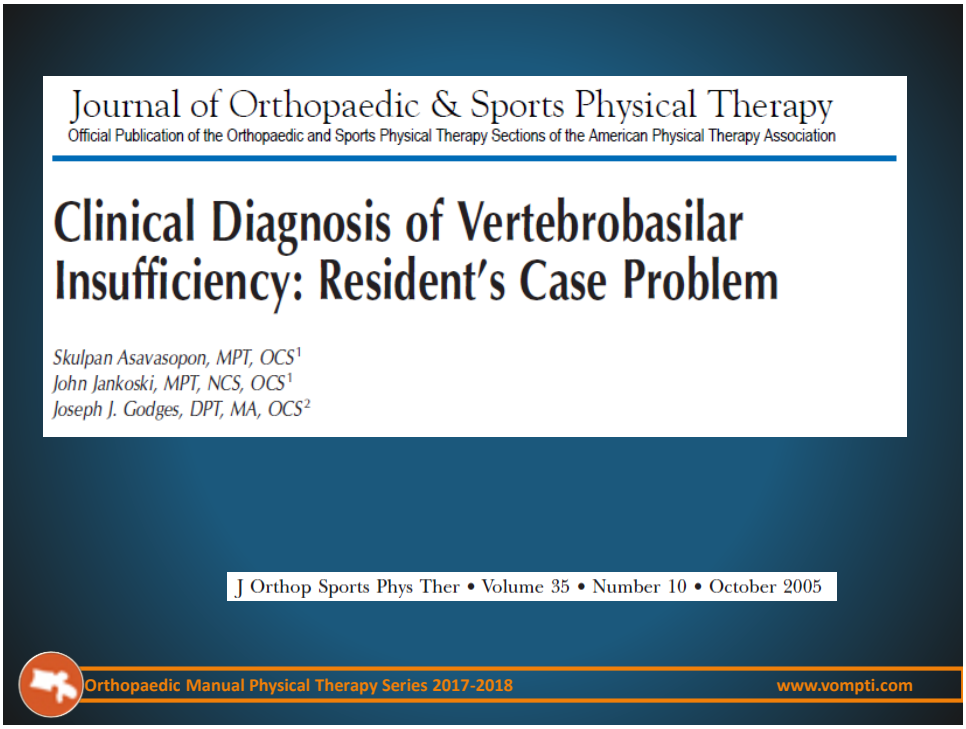


Fig. 38.11 Stress test for left alar ligament.



- 63 yo female referred for neck P!
- PMHX: HTN, Hyperlipidemia
- Chief c/o:
  - Intermittent vertigo lasting >1 minute, aggravated by cervical rotation ®
  - Visual changes: "black spots", "distortion" ® eye lasting > 30 minutes, progressing
  - ® frontal orbital headaches
  - ® shoulder P!
- Visual changes reproduced with passive Cervical EXT
- Referred back to MD
- (+) MRA: 90% occluded ® carotid

Vertebral Basilar Insufficiency

- NOT sensitive or specific
- Based on knowledge of anatomy, and pathophysiology of the vertebral basilar system.
- Test Risky - using CNS function as a monitor.
- Simple and important test if the therapist is going to be mobilizing upper cervical vertebral or approaching end ROM with any treatment techniques.

Should we do VBI testing?

- Poor sensitivity/specificity
- Use of monitoring CNS dysfunction – provocation
- Assume occlusion of VA and/or Carotids
- Assess collateral circulation
- Studies + CVA following manip (-) VBI tests

"Do No Harm"

Screening for Vertebrobasilar Insufficiency in Patients With Neck Pain: Manual Therapy Decision-Making in the Presence of Uncertainty

John D. Childs, PT, PhD, MBA, OCS, FAAOMPT[1]
Timothy W. Flynn, PT, PhD, OCS, FAAOMPT[2]
Julie M. Fritz, PT, PhD, ATC[3]
Sara R. Piva, PT, PhD, OCS, FAAOMPT[4]
Julie M. Whitman, PT, DSc, OCS, FAAOMPT[5]
Robert S. Wainner, PT, PhD, OCS, ECS, FAAOMPT[6]
Philip E. Greenman, DO, FAAO[7]

JOSPT 2005

"Proceeding in the Presence of Uncertainty"

- Subjective History
- Trauma/mechanism
- Canadian C spine rules
- Assess Progressive loads to VA
- Mobilization versus Manipulation
- Avoid end ROM cervical rotation
- Thoracic mobilization versus cervical

Contents lists available at ScienceDirect

Manual Therapy

journal homepage: www.elsevier.com/math

Original article

International framework for examination of the cervical region for potential of Cervical Arterial Dysfunction prior to Orthopaedic Manual Therapy intervention

A. Rushton [a,*], D. Rivett [b], L. Carlesso [c], T. Flynn [d], W. Hing [e], R. Kerry [f]

Data obtained from physical examination

Interpretation of data from physical examination using evidence informed knowledge, and cognitive and metacognitive processes. Interpretation includes analysis of patient's preferences.

Evaluation of patient's presentation

- Any gaps in data from assessment?
- Quality of data obtained?
- Risk versus benefit analysis?
- Decision regarding action?

Best decision regarding management

- In collaboration with the patient

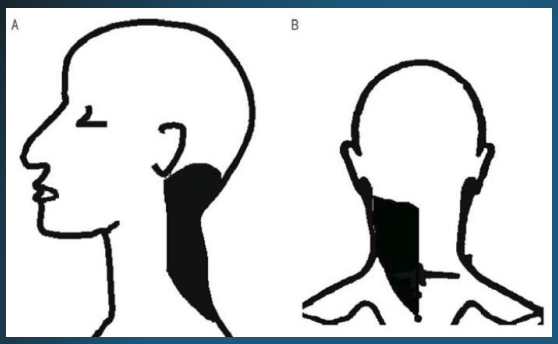
Manual Therapy 19 (2014) 222–228

Cervica ion:
Knowle g for
Manu ists

. TAYLOR, MSc, MCSP²

Internal Ca
Artery

JOURNAL OF ORTH MBER 5 | MAY 2009



Pain distribution:
Internal Carotid Artery Dissection

Pain distribution:
Extra cranial Vertebral Artery Dissection

TABLE 2 DIAGNOSTIC UTILITY OF THE VERTEBROBASILAR INSUFFICIENCY (VBI) TEST*

Author	Sensitivity	Specificity	LR+	LR–
Cote et al 1996	0.00	0.86	0.00	1.16
Rivett et al 2000	0.10	0.94	0.16	2.30
Kerry et al 2003	0.31	0.48	0.59	1.44
Kerry 2006	0.10	0.44	0.16	2.30

** LR+ is the likelihood ratio for a positive test. LR– is the likelihood ratio for a negative test. The further away from 1 (on a scale of 0.001 to 1000) the LR is (LR+, above 1; LR–, below 1), the better the test at ruling the condition in or out. Above 10 would be considered a good LR+, and below 0.01 would be considered a good LR–. All readings from the studies in the table would indicate poor and inconsistent findings for the diagnostic utility of the VBI test.*

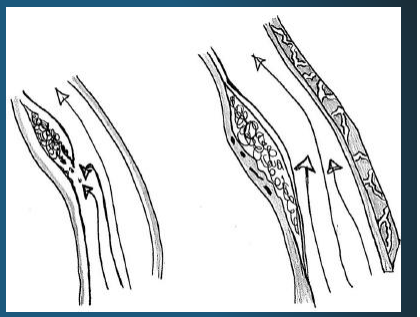
Worthless Metrics

Recommendations

- "Evidence Informed Decision Making"
  - Risk Based Analysis
- High index of suspicion following trauma
- Somatic P! has as precursor to ischemia
- Understand Anatomy/Hemodynamics
- Understand limitations of diagnostics tests
- Enhance Subjective/Objective exam
  - ? HTN as vascular risk factor
  - CN testing
- Acute onset Headache "like no other"
- Triage appropriately

Cervical arterial dissection: An overview and implications for manipulative therapy practice
Manual Therapy 21 (2016) 2–9

- Etiology: unknown
  - ? Genetic predisposition
  - ? URTI relationship
- Early mimics HA
  - HA "like none previously"
- Manipulation may worsen an existing dissection, damage susceptible vessel
- COMPREHENSIVE HISTORY
- Subtle/transient Neuro signs/sxs
  - Dizziness, visual changes, gait/balance dysfxn, speech difficulties, weakness

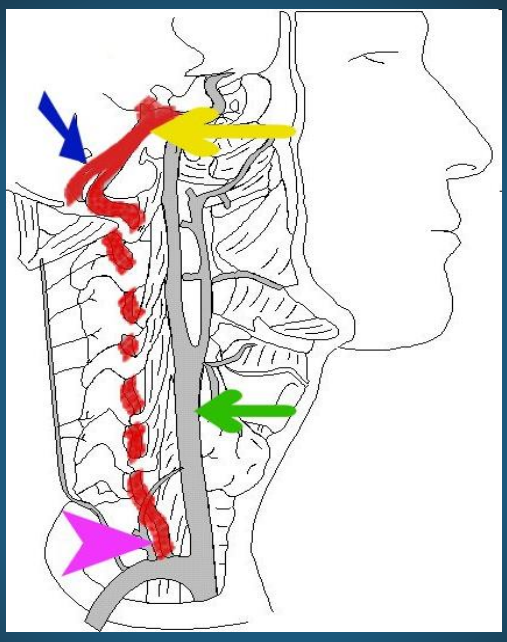


Vertebral Basilar Insufficiency

- Purpose of testing:
- To reproduce signs/sxs potentially attributable to Vertibrobasilar insufficiency either by testing or pt history
- To differentiate those signs/sxs if they are non cardinal
- To determine the risk to the patient of treating cervical spine any way which threatens the vertebral artery.
- To assess if the individual has adequate collateral circulation from the internal carotids to sustain CNS function if the vertebral arteries are closed off.

Anatomy

- Arises from the subclavian vessels
- Enters through the foramina transversaria at C6 to the transverse foramen of C1
- Overlying the transverse canal are scalenii, longus colli muscles, the lateral margins of the vertebral bodies and the superior facets of the zygapophyseal joints
- Exits the transverse foramen at C1 the artery winds behind the mass of the superior articular pillar crossing the posterior arch
- Runs forwards, inward, and upward eventually piercing the posterior atlanto-occipital membrane to enter the foramen magnum
- Unites on the front of the brain stem to form first the basilar artery
- Divides to form the two posterior cerebral arteries



??? Rotation = Occlusion

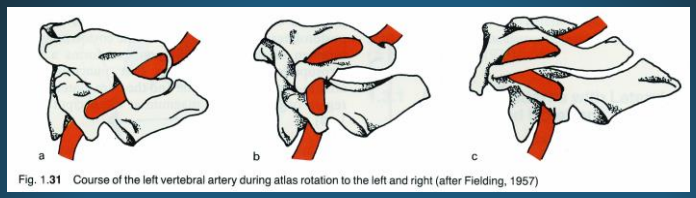
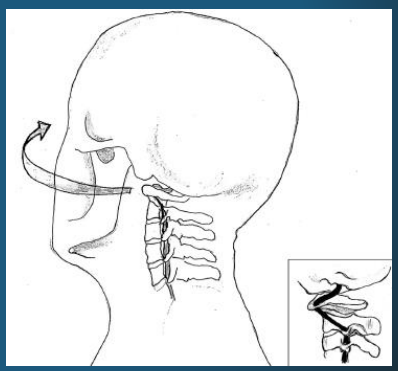
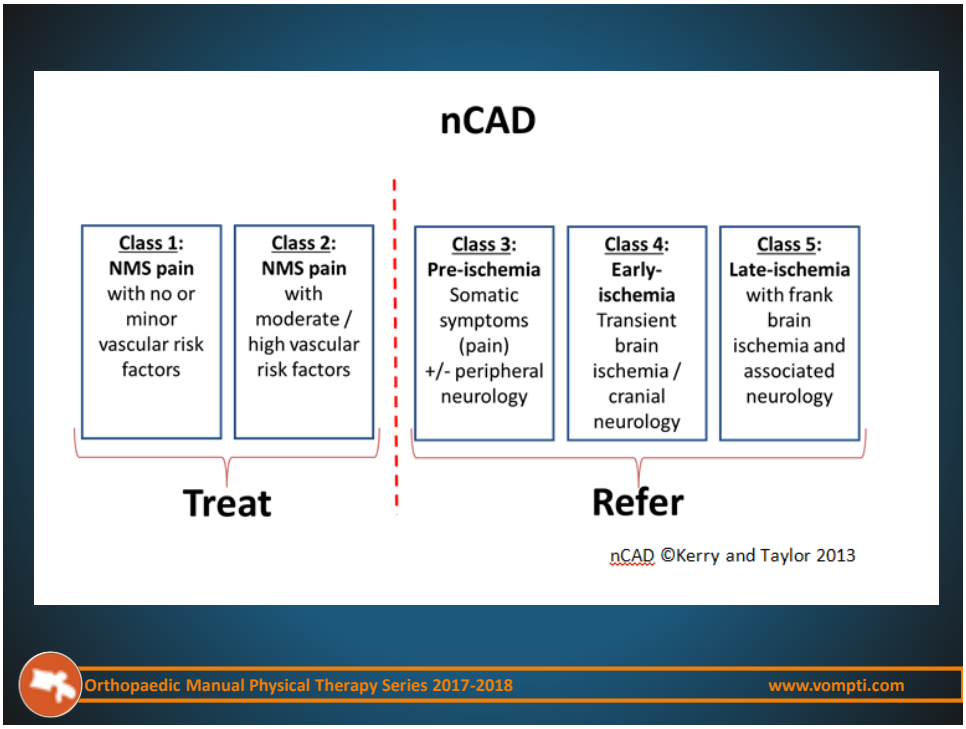


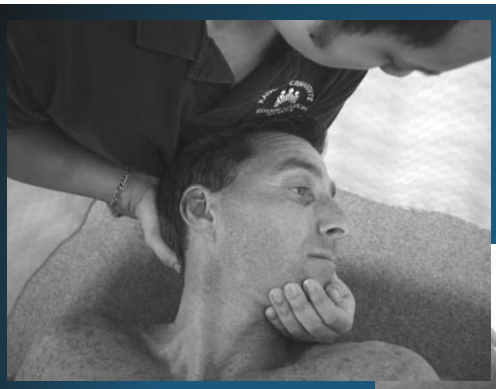
Fig. 1.31 Course of the left vertebral artery during atlas rotation to the left and right (after Fielding, 1957)

- Blood flow studies
- Conflicting results
- Significant variability
- Risk with multiple vessel pathology





- Comprehensive History first – Assess Risk
- Increasing the stress gradually
- Assess for signs of: nystagmus, altered pupil dilation, slurring of speech, slowness in response, difficulty swallowing, dizziness/vertigo, headache, tinnitus, distress.
- Pt supine and head supported over the edge of table
- Positions of progressive stress held for 15 seconds, asking the patient to count backwards from 15.
- Sustained traction
- Sustained rotation each direction
- Sustained extension
- Sustained extension/rotation each side
- Sustained mobilization position



Progressive loading

Monitor for symptoms

Upper Cervical Exam

- Active, Passive + Overpressure, Resisted
  - OA Flexion
  - OA Extension
  - OA Side Bend
  - AA Rotation

- Important to maintain axis of motion to ensure only CV motion
  - Flexion/Extension axis is ear
  - Side Bend axis is through the nose

Upper Cervical Exam

- AROM
- PROM + Overpressure
- Physiological mobility testing (PPIVM)
- Accessory mobility testing (PAIVM)
- Special Tests - OA, C1/C2

- OA:
  - Flexion/Extension
  - Side Bending
- C1/2:
  - Mid Cervical Flexion/ Head Rotation
  - Mid Cervical SB/ Head

Mobility Assessment of OA Joint (C0/1)

- Primary Motion = Flexion/Extension > SB
- Active
  - OA: Flex/EXT, SB
  - Full rotation + "head on "neck "nodding
- Passive (PIVM)
  - Supine
  - OA Flexion/Extension
  - Rotation 30 degrees towards side being tested
    - Contralateral SB (PPIVM)
    - Side Glide (PAIVM)

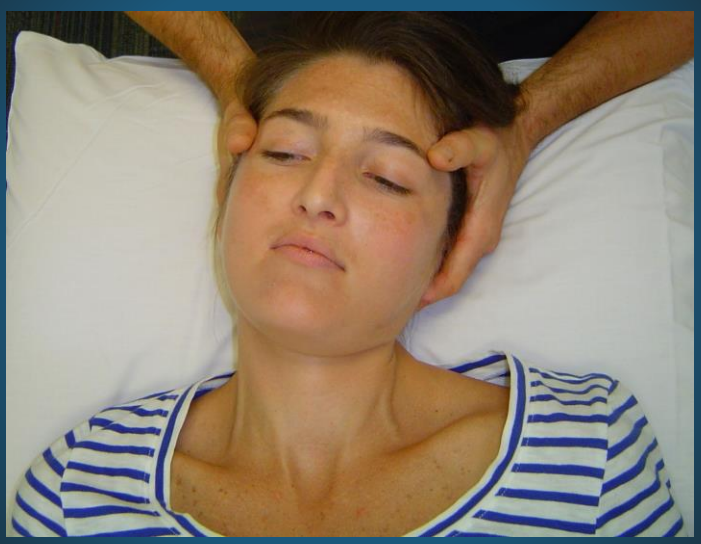
- Assess
  - Amount of motion
  - Provocation
  - End feel
  - Neutral zone
  - Soft tissue response
  - Compare to contralateral side

OA Joint AROM Screen

OA Flexion Passive + Overpressure

OA Extension Passive + Overpressure

OA Side Bending

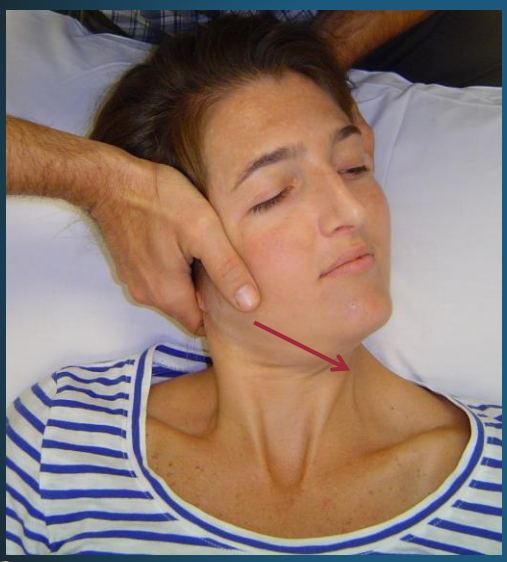


OA Joint PPIVM

- Rotation 30 degrees
- Contralateral Occipital Side

- Rotate (L). Side Bend head on neck (R) to assess (L) OA opening

OA Joint PAIVM



- Rotation 30 degrees
- Contralateral Occipital Side Glide

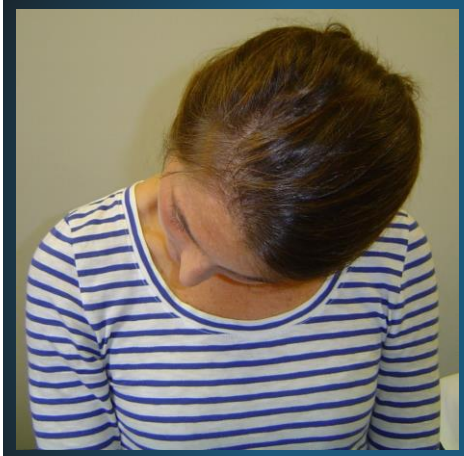
- Rotate (L), Side Glide head on neck (R), to assess (L) OA opening

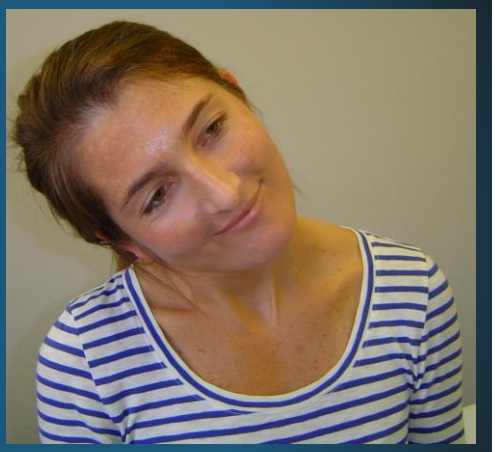
Mobility Assessment of C1/2 (AA)

- **Primary Motion = Rotation**
- Active
  - Full Cervical Flexion : Rotation
  - Full Cervical Side Bend: Rotation
- Passive Physiologic (PPIVM)
  - Supine
  - Cervical Flexion-Rotation Test (CFRT)
  - Maximal Flexion → Cervical Rotation
  - Maximal SB → Cervical Rotation
- Passive Accessory (PAIVM)
  - Central PA
  - Unilateral PA

- **Assess**
  - Amount of motion,
  - Provocation
  - End feel
  - Neutral zone
  - Soft tissue response
  - Compare to contralateral side

C1/2 (AA) Joint Rotation AROM





Flexion/Rotation (+) R Contralateral Side Bend/Rotation

C1/2 (AA) PPIVM

Flexion - Rotation

(+) R

Contralateral Side Bend - Rotation

The diagnostic validity of the cervical flexion–rotation test in C1/2-related cervicogenic headache

- **Cervical Flexion-Rotation Test (CFRT) for C1/2 dysfunction (Cervicogenic HA)**
- **(+) if < 32 degrees**
- **Sensitivity = 91%**
- **Specificity = 90%**

(+) R

Manual Therapy 12 (2007) 256–262

Physical examination tests for screening and diagnosis of cervicogenic headache: A systematic review

Manual Therapy 21 (2016) 35–40

5. Conclusion

There is sufficient evidence showing high levels of reliability and diagnostic accuracy of the selected physical examination tests for the diagnosis of CGH. The CFRT has better level of evidence and highest values of validity, reliability and diagnostic accuracy for use in the differential diagnosis of CGH. Therefore, the clinical tests selected for evaluation of the upper cervical spine can be used by therapists in a reliable and accurate way for the diagnosis of CGH. More high quality case-based, case control studies in relation to the prevalence of CGH in different groups of population are necessary.

C1/2 (AA) PAIVM

- Posterior to Anterior Provocation Testing
  - Central PA C1
  - Central PA C2
  - Unilateral C1/2
    - PA on C1
    - PA on C2 rotated 30 degrees toward
  - Unilateral C2/3
    - PA on C2 neutral
    - Or supine testing lateral glide

Reliability of manual examination and frequency of symptomatic cervical motion segment dysfunction in cervicogenic headache

Manual Therapy 15 (2010) 542–546

Toby Hall*, Kathy Briffa, Diana Hopper, Kim Robinson

School of Physiotherapy, Curtin Innovation Health Research Institute, Curtin University of Technology, Hayman Road, Bentley, Perth, Western Australia

- **Assessment of reliability of manual assessment of C0/1 – C4 and to identify segment most frequently involved in CH**
- **C1/2 segment most commonly symptomatic**
- **Highlights the importance of examination and treatment procedures for this segment**

**** Physical Exam "Asterisks" Signs/Symptoms ****
(Special Tests, Movement/Joint Dysfunction, Posture, Palpation, etc.)

* (-) UMN, CN, CAD, Stability testing, Reproduce dizziness
* < 25% Cervical Rotation ®, EXT - with HA provocation
* (+) Cervical Flexion Rotation Test
* (+) PPIVM limitation/provocation C1/2 ®
* (+) PAIVM limitation/provocation C1/2 ®

Identify any potential risk factors (Yellow, Red flags, non MSK involvement, biopsychosocial)

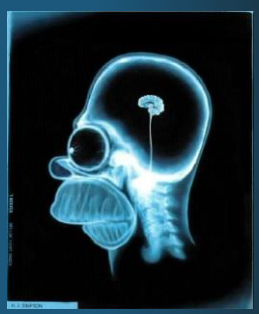
- Mechanism
- Headache primary c/o
- Intermittent Dizziness
- > 50 yo
- Initial transient UE sxs
- Apprehensive
- Anxious to return to work

Are the relationships between the areas on the body chart, the interview, and physical exam consistent?
"Do the "Features Fit" a recognizable clinical pattern?" – If "Yes" – what : _____

- Cervicogenic Headache secondary to upper cervical (C1/2) ® joint dysfunction

Cervicogenic Headache

- Affect approx 2.5% of population
- Account for 15-20% of all chronic and recurrent headaches
- Pathogenesis may originate from various structures in cervical spine
- Convergence of afferents of the trigeminal and upper three cervical spine nerves in the trigeminal nucleus in the upper cervical spinal cord (~C2/3) is likely to lead to headache



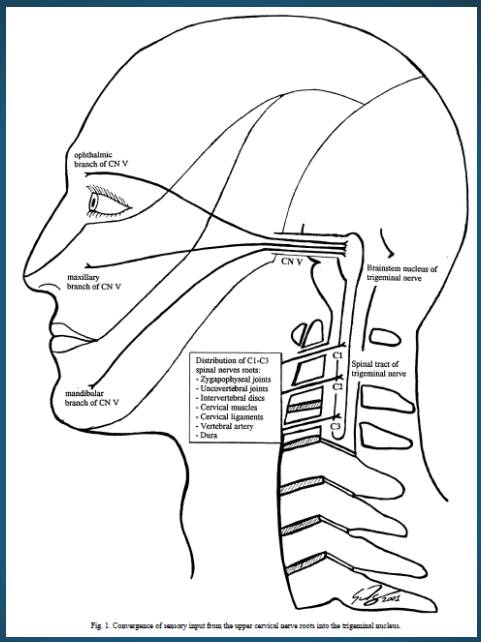


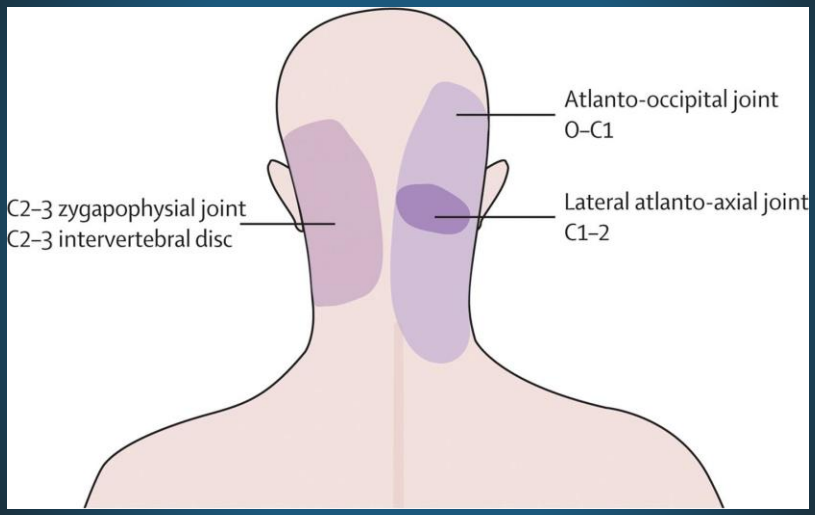
Fig 1. Convergence of sensory input from the upper cervical nerve roots into the trigeminal nucleus.

Cervical musculoskeletal impairment in frequent intermittent headache. Part 1: Subjects with single headaches

- **Differentiate Cervicogenic HAs from migraine/cluster HAs**
- **Restriction Cervical ROM**
  - **Extension**
  - **Rotation**
- **Tender to palpation upper cervical facets**
- **Decreased Cervical strength/endurance; motor control dysfunction**
  - **Incr EMG SCM with CCFT**
- **Sens: 100%; Spec: 94%**

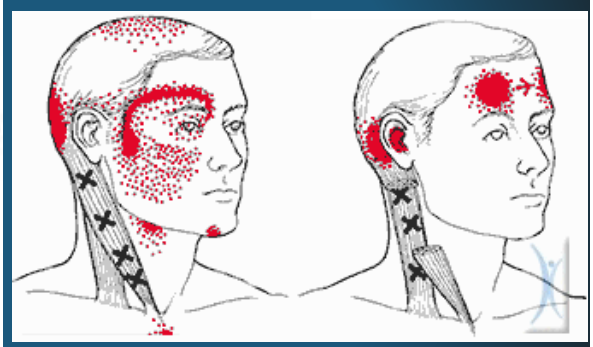
Cephalalgia, 2007,

Cervical Facet Referral



Cervicogenic Headache Myofascial Trigger Point Referral Patterns

Upper Trapezius

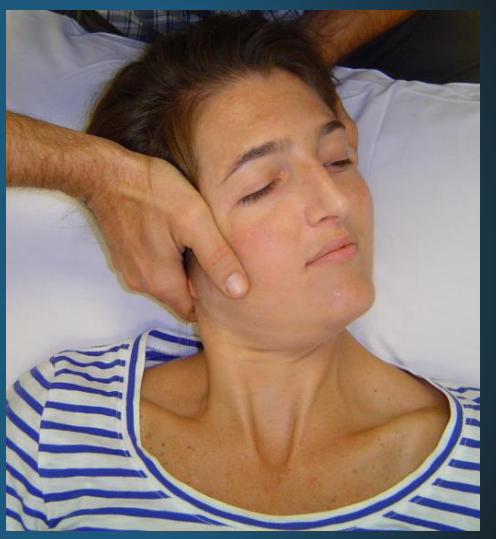


What is your Primary Treatment Objective after Initial Evaluation?

- **Education:** _____
- **Manual Therapy** (Specific Technique): _____
- **Exercise Prescription** (Specific): _____
- **Other:** _____

Upper Cervical Treatment – OA Joint

Longitudinal Distraction Mobilization/Manipulation



Side Glide Mobilization

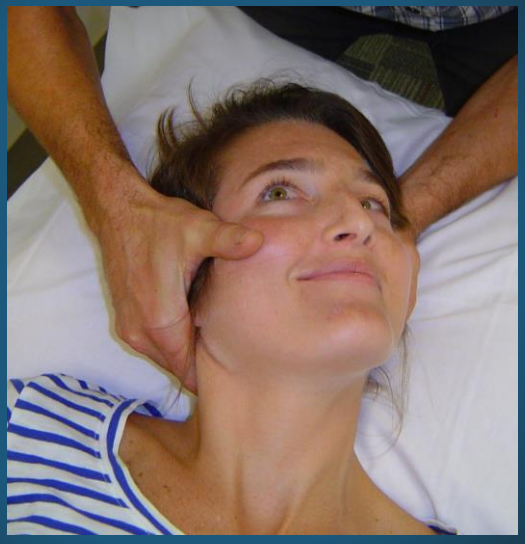
Upper Cervical Treatment – C1/2

Unilateral PA Mobilization (C1/C2)

MET

C1/2 Manipulation

???



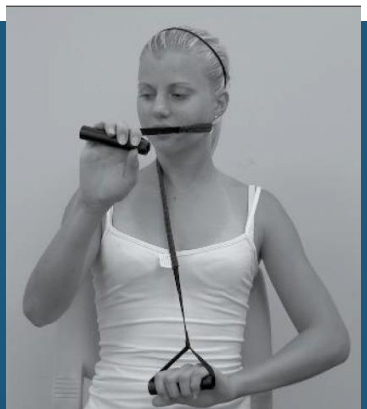
Upper cervical and upper thoracic manipulation versus mobilization and exercise in patients with cervicogenic headache: a multi-center randomized clinical trial

Dunning *et al. BMC Musculoskeletal Disorders* (2016) 17:64

Conclusion

The results of the current study demonstrated that patients with CH who received cervical and thoracic manipulation experienced significantly greater reductions in headache intensity, disability, headache frequency, headache duration, and medication intake as compared to the group that received mobilization and exercise; furthermore, the effects were maintained at 3 months follow-up. Future studies should examine the effectiveness of different types and dosages of manipulation and include a long-term follow-up.

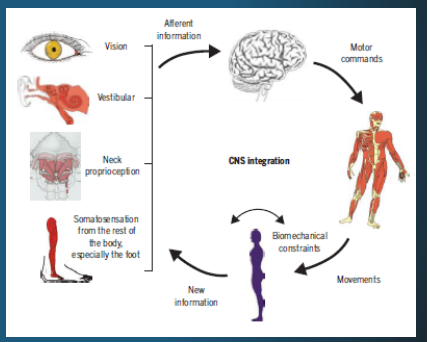
Efficacy of a C1-C2 Self-sustained Natural Apophyseal Glide (SNAG) in the Management of Cervicogenic Headache



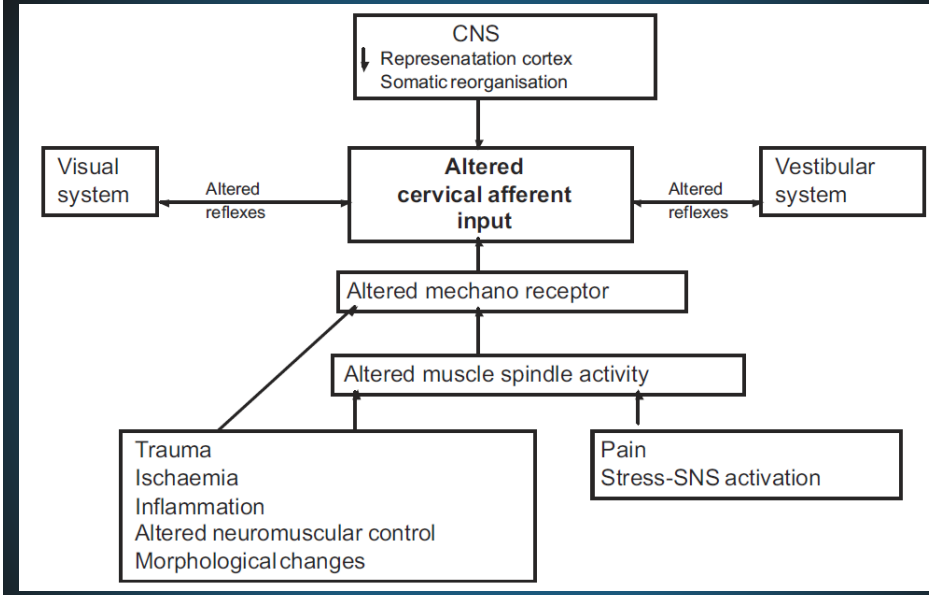
MARCH 2007 | VOLUME 37 | NUMBER 3 | JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY

Sensorimotor Function and Dizziness in Neck Pain: Implications for Assessment and Management

- **Mechanoreceptors in the cervical spine involved in postural control, head & eye movement control**
- **Altered afferent input from mechanoreceptors produce sensorimotor deficits**

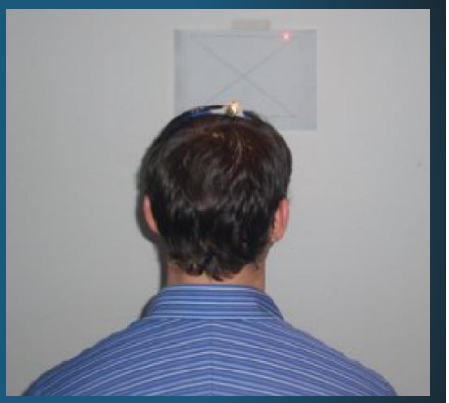


JOSPT 2009



Rehab Program

- Input from Cervical spine afferents alter function of occulomotor system
- Manual Therapy
- Proprioceptive Rehab Program
- Cervical Occular Motor Exercises



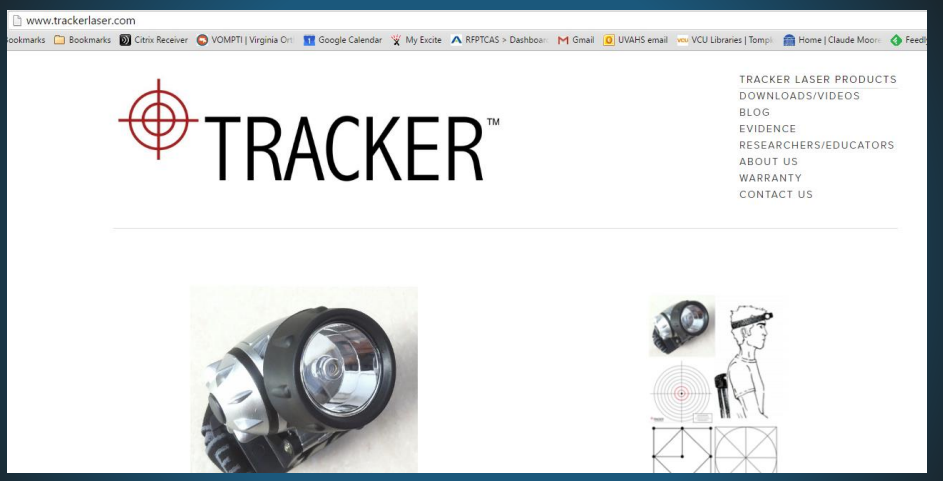
J. Treleaven / Manual Therapy 13 (2008)

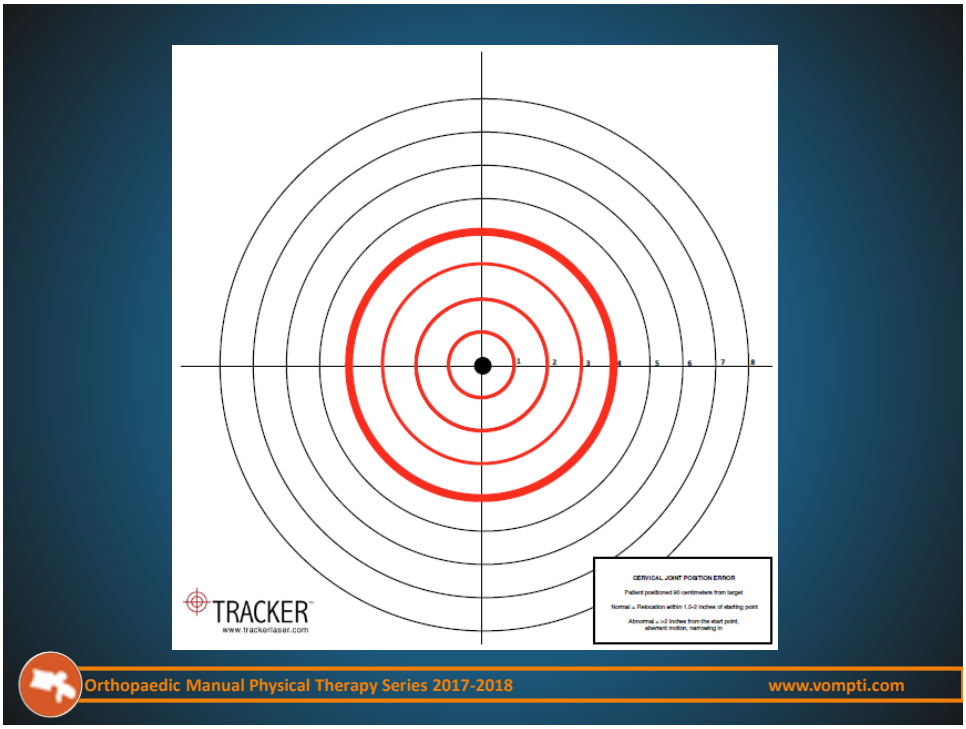
Proprioceptive Rehab Program

- Joint Position Sense
- Progression
  - Fixed gaze slow passive head movements
  - Fixed gaze slow active head movements
  - Fixed gaze active trunk movements
  - Joint positions sense
    - Fix on target, close eyes, active rotation, return to target, open eyes, assess accuracy

Cervical Occular Motor Exercises

- **Smooth Pursuit:** Head still, eyes follow moving target
- **Saccades:** Head still, quickly move eyes between targets
- **Gaze Stability:** Move head side to side maintain gaze on stationary target
- **Eye/Head Coordination:** Move head and hand held target in opposite directions – maintain gaze
  - Progress
    - Speed
    - ROM
    - Background
    - Frequency/duration
    - Base of support





Clinical Reasoning_Pattern Recognition

Identify the key subjective and physical features (i.e. **clinical pattern)** that would help you recognize this disorder in the future.

**** Subjective ****

- Mechanism
- Headache distribution/description
- R/O: Special Questions
  - (-) Upper Cervical Instability
  - VBI
  - Fracture
  - CN
  - UMN

**** Objective ****

- (-) Upper Cervical Screen/Clear
- Limited Cervical Rotation ®, EXT with HA provocation
- (+) Cervical Flexion Rotation Test
- (+) PPIVM limitation/provocation C1/2
- (+) PAIVM limitation/provocation C1/2

Reflection : What would you do differently with a similar patient in the future?

- Rule Out: Etiology Dizziness, HAs
  - Special Questions, Special Tests
- Upper Cervical Screen/Clear
- Rule In MSK/Mechanical etiology of Sxs/HAs
- Specific Treatment based on provocation
  - Manual Therapy
  - Sensorimotor Training

Orthopaedic Manual Physical Therapy Series 2017-2018 www.vompti.com